

TUNABLE FILTER SOLVES PROCESS PROBLEMS

Acousto-optic tunable filters create near-infrared instrumentation that speeds up real-time process control and analysis for a broad range of industries.



■ A near-infrared spectrometer developed at Brimrose ensures that the right pills and powders (pictured above) are in the right vials for the pharmaceutical industry.

Near-infrared (NIR) spectroscopy is ideal for keeping industry under control. NIR spectrometers will allow manufacturers to analyze industrial process problems. But mechanical-based versions have speed and reliability limitations that greatly reduce their effectiveness and survivability on the production line.

Brimrose Corporation of America (Baltimore, MD) has developed acousto-optic tunable filter (AOTF) technology that makes NIR spectroscopy a faster, more reliable tool for monitoring industrial processes. The company's all solid-state tunable filters eliminate the need for moving parts, such as rotating gratings and mirrors, to scan the NIR spectrum. This improvement not only enhances the system's reliability, but also increases its speed. While grating or mirror-based systems could scan a range of interest only once per second, Brimrose's AOTF technology can scan the same area more than 30 times faster.

Ultrasonic waves. An AOTF is a compact optical device that uses ultrasonic waves to alter the index of refraction of an optical crystalline medium. The device can obtain data in the NIR with a high degree of wavelength resolution in practically real time. Also, because the AOTF technology is all solid-state, it is rugged and has a long lifetime. In addition, the system is pre-aligned so it does not require lengthy alignment upon replacement. BMDO originally funded Brimrose's research in acousto-optics for use in optical communications, optical computers, and guidance and surveillance systems.

AOTF technology is key to successful NIR spectroscopy. "The slow data acquisition of traditional NIR instruments has been a major drawback to their commercial use in real time, closed-loop monitoring and control of industrial processes," says Dr. Gabriel Levin, Brimrose's director of applications development. "However, being able to quickly tune from one wavelength to another, AOTF technology provides rapid results. Combined with inexpensive microprocessors and powerful software, it can greatly benefit production-line technology."

Brimrose's AOTFs, which are able to analyze roughly 25 pills per second while the pills are on the conveyor belt, can be used for quality control in the pharmaceutical industry. In this way, manufacturers can ensure that the correct pills are going into the correct vials. Processing improvements are expected to increase the AOTF's capability to 100 pills per second. In either case, the sys-

tem's performance compares well to other spectrometers, which at best can read two tablets per second. In a slightly different application in the same industry, AOTFs can be used to ensure that mixtures of pharmaceutical powders are blended uniformly and that solvents are recovered efficiently.

AOTF technology also can be used to monitor the properties of petrochemicals to ensure their quality. For example, it can be used to monitor kerosene's flash-point, which is the temperature at which kerosene can self-ignite and is related to the chemical features of the substance. It is used to automatically control the proper blending of gasoline mixtures to create the desired octane number. AOTFs have also been used to verify the proper mix of bleach for a bleach manufacturer, allowing the manufacturer to optimize the amount of water that can be used, thereby realizing savings in chemical costs. The manufacturer had previously used too much chemical intentionally to ensure that the bleach would meet minimum specifications.

The AOTF holds promise for many other production-line applications. It may be used on an assembly line to ensure quality production of ceramic cores for turbine blades. It also can help monitor the casting of large aluminum parts for automobiles. For consumer products, the AOTF has monitored the thickness of plastic film as the film is running on the rollers and has detected lack of uniformity in the material. In food applications, it has monitored the moisture content of herbs and spices before final grinding and checked orange juice quality. And in dairy plants, the spectrometer has been used to control production of butter, buttermilk, cream, and processed cheese.

Pill inspection. Brimrose has found widespread commercial success marketing its technology to the pharmaceutical industry. The company has sold more than 60 systems in this area. These systems are being used by some of the world's leading pharmaceutical companies, including Pfizer, Merck & Company, SmithKline Beecham, Hoffmann-La Roche, Ortho-McNeil, and Eli Lilly and Company. In some cases, the systems are used for quality control in solvent recovery and bulk powder inspection. They are also used for powder blending and tablet inspection.

The company is making its presence known overseas as well. It has four wholly owned subsidiaries in Brazil, Israel, the United Kingdom, and Germany. An additional company is planned for 1999 in Israel. Brimrose also works through distributors in the international arena, such as in Scandinavia, Korea, and Japan.

■ For more information, contact Dr. Gabriel Levin via telephone at (410) 931-7200 or via E-mail at glevin@brimrose.com. You can also visit Brimrose's Web site at <http://www.brimrose.com>.



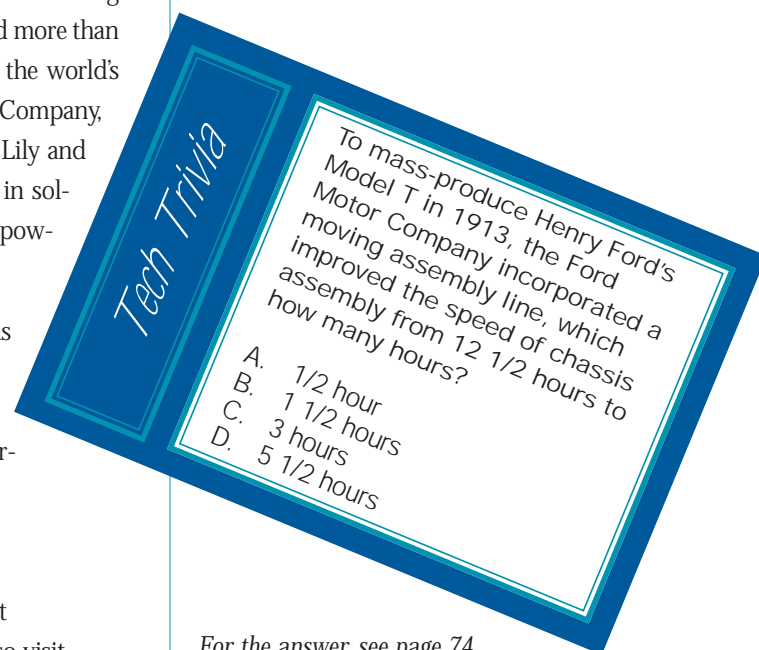
What Does It Mean to You?

Acousto-optic tunable filters will help monitor industrial processes more accurately, ensuring that pharmaceuticals are properly bottled and labels on edible products are more readable and accurate.



What Does It Mean to Our Nation?

Systems based on acousto-optic tunable filter technology will help U.S. manufacturers speed up processes, thus reducing production time while increasing quality control.



For the answer, see page 74.